

## REMARKS

### **Independent Claim 1 and Dependent Claims 2-5 and 7**

The Examiner has rejected independent claim 1 under 35 U.S.C. §103 based upon U.S. Patent No. 5,632,381 to Thust et al. But, as the Examiner has acknowledged, Thust does not show or suggest sensing the presence of printed material on the paper as one of the characteristics upon which sorting is to be based. The only support the Examiner has provided for his rejection of a claim including the feature of printed matter detection is the Examiner's wholly unsupported contention that "it would have been obvious to add the known sensors for determining the color of paper and the printed material to sort different types of paper without changing the setup."

Independent claim 1 requires that three characteristics of the paper be analyzed, namely color, glossiness, and the display of printed material. All three characteristics must be analyzed.

Neither Thust et al. nor any of the other cited references in any way show or suggest analysis of the presence of printed material on paper as a characteristic upon which sorting can be based, and certainly none of the cited references disclose any of the particular techniques disclosed in the present application for identifying the presence of printed material.

The Examiner's rejection is simply unsupported. If the Examiner could cite a secondary reference which taught the identification of the presence of printed material as a characteristic to be used in sorting papers, then perhaps

that reference could be combined with Thust et al. to support a rejection such as the Examiner has made. But in the absence of such teaching the rejection is completely improper.

Contrary to the Examiner's unsupported allegation, to the best of Applicant's attorney's knowledge there is no prior art teaching of the detection of printed material as a basis for sorting of waste paper, and the present invention is the first to propose analysis of the presence of printed material as a factor in sorting waste paper.

Accordingly, it is respectfully submitted that claim 1 and all claims dependent therefrom should be allowed.

The Examiner has rejected claims 2 and 3 based upon Thust in view of U.S. Patent No. 6,373,575 to Takayama et al.

First it is noted that Takayama in no way supplies the missing element of analyzing "whether the paper displays printed material" as required in parent claim 1. Furthermore, with regard to claim 3 which requires the step of "selecting a category of paper to be sorted from the other paper being conveyed through the inspection zone" the Examiner has once again resorted to pure speculation and has not provided any substantive basis for the rejection. The Examiner acknowledges that "Takayama does not disclose selecting a category of paper to be sorted." Then the Examiner goes on to make the wholly unsupported statement that "However, the skilled artisan would have been motivated to modify Takayama for selecting a category of paper to be sorted to

make the user fully control the category of paper to be sorted.” Nothing could be further from the truth. If the Examiner will take the time to fully analyze Takayama he will see that there is no reason for any selection to be provided in Takayama because the Takayama device inherently sorts the paper passing therethrough into three categories. The Takayama et al. device is directed to a unique system which proposes to replace conventional photocopying systems with a proposed one in which erasable ink would be used. The idea is that office paper could be reused by subjecting the used paper to heat to erase the image therefrom. To make such a system workable, Takayama et al. developed their disclosed paper sorting system in order to identify and recover the paper for recycling. Thus their system takes all of the incoming paper and sorts it into three classes, namely plain paper, plain paper having an image formed with erasable image-forming material, and thermosensible paper.

It is noted that in addition to dependent claims 2 and 3 which the Examiner considered, dependent claims 4, 5 and 7 are also readable upon the elected species III, as they all relate directly to measurement of color.

Of particular significance are claims 5 and 7 which are directed to specific mathematical manipulations of the measured data to determine color. Claim 5 is directed to determining “a log slope of intensities of the reflected light from the first and second sources” which is described with reference to step 204 in Fig. 7 of the application, and which relates to the determination of color.

Claim 7 is directed to determination of “a combined intensity of the reflected light from the first and second sources” which is directed to the step described with regard to step 212 of Fig. 7 of the application, and which relates to the determination of color.

None of the cited references in any way show or suggest these particular techniques for determination of color of the object being examined.

Accordingly those dependent claims should be allowed for these further reasons.

#### **Independent Claim 12 and Dependent Claims 13-18 and 22-23**

The Examiner has rejected independent claim 12 under 35 U.S.C. §1023 based upon Thust as discussed above regarding claim 1.

Independent claim 12, similar to independent claim 1, includes as feature thereof “a printed matter determination component”. As explained in detail above with regard to claim 1, none of the cited references in any way show or suggest the use of “a printed matter determination component” as an element in an apparatus for sorting paper. Accordingly, claim 12 and all claims dependent therefrom should be allowed.

With regard to the dependent claims, particular attention is directed to the following.

Claims 15 and 16 are directed to a human interface system which includes a plurality of predefined options for sorting of predefined categories of

paper so that a human operator may select one of the predefined options. With respect to those claims the Examiner has cited Thust in view of U.S. Patent No. 6,373,575 to Takayama et al. Even the Examiner has noted that Takayama still does not disclose selecting a category of paper to be sorted. Once again the Examiner has resorted to pure speculation in his contention that “the skill artisan would have been motivated to modify Takayama for selecting a category of paper to be sorted to make the user fully control the category of paper to be sorted”. As discussed above with regard to claim 3, a skilled artisan would have done no such thing, because Takayama always sorts its paper stream into three groups and there is no need for any sort selection capability. With respect, the Examiner is going far beyond a proper scope of a 103 rejection in his unbridled speculation about what the art might show or what a skilled artisan might do, in the complete absence of any teaching suggesting these missing features in any analogous context.

It is noted that dependent claims 17 and 18 very clearly are directed to color determination and should have been included as readable on the elected species. These claims are most closely related to claim 53 which the Examiner did examine and rejected based simply on Thust et al. It is noted, however, that Thust does not disclose a myriad of features found in claim 17. Thust does not disclose using red, green and blue lights. Thust does not disclose using light emitting diodes. And Thust does not disclose sequentially flashing red, green and blue light emitting diodes. Further, Thust does not show or suggest

comparing reflected intensities of red, green and blue lights to determine the color of the paper.

In his discussion of analogous claim 53 at page 2 of the Office Action the Examiner has once again resorted to unsupported speculation. He concedes that Thust does not show any of these features involving sequentially flashing red, green and blue light emitting diodes, and he once again makes the unsupported statement that such light sources and sensor elements "would have been known". That simply is not a proper basis for rejection of the claims.

Accordingly, it is respectfully submitted that independent claim 12 and all claims dependent therefrom should be allowed for the reasons discussed above.

#### **Independent Claim 24 and Dependent Claims 25 and 26**

The Examiner had rejected claim 24 under 35 U.S.C. §103 based upon Thust et al.

The Examiner states his rejection as follows:

"With respect to claim 24, refer to discussion in claim 1 above. Further, Thust does not disclose the speed of the convey. However, it would have been obvious a design choice to operate Bruner's (sic Thust's) system with different speed to facilitate the sorting."

With respect, there is once again absolutely no support for the Examiner's contention. Furthermore, the Thust reference utilizes a mechanical impacting sensor, i.e. a hammer which strikes the paper, which is inherently a much slower technology than are touchless light-reflecting sensor systems. Accordingly, there is no basis for the Examiner's contention that a mechanical impacting system like Thust et al. could operate at speeds anywhere approaching "at least 1000 feet per minute" as required by claim 24. The same is even more true for claim 25 which requires that the speed be at least 1500 feet per minute.

With regard to claim 26, the Examiner has rejected that claim based upon Thust in view of Takayama. The Examiner has referred to his "discussion in claim 2 for comparing the reflected signal." The Examiner goes on to contend that "Thust discloses a plurality of separate sources (Fig. 2)." Once again, the Examiner's rejection falls far short of being even a *prima facie* basis for a 103 rejection, because the Examiner has not cited any reference in this rejection which includes the step of "exposing the paper in the inspection zone to a plurality of separate sources of visible light of different wavelengths". But, while Takayama does disclose two light sources 45 and 56, there is absolutely no disclosure that those are "sources of visible light of different wavelengths". There is no reason to believe that those sources are anything other than plain white light sources.

Accordingly, independent claim 24 and all claims dependent therefrom should be allowed, especially dependent claims 25 and 26, for the reasons just discussed.

### **Independent Claim 31 and Dependent Claims 32-35 and 38-42**

The Examiner has rejected these claims under 35 U.S.C. §103 based upon Thust in view of U.S. Patent No. 6,263,291 to Shakespeare et al. With regard to claim 31 the Examiner stated his rejection as follows:

“With respect to claim 31, Thust discloses a method for sorting paper by using a plurality of separate beams 25 (fig 2). However, Thust does not disclose analyzing the color based upon a comparison of the reflected light of different wavelengths. Shakespeare discloses a method for analyzing a color of an object. The method comprises: illuminating the object with at least three illumination bands singly (abstract), comparing the reflected light with a reference light (abstract). It would have been obvious to modify Thust with Shakespeare’s analyzing method to detect the color of the paper more efficient.”

That rejection is respectfully traversed for the following reasons. Once again the Examiner is completely misinterpreting Thust. The elements 25 shown in Fig. 2 of Thust are not light sources. As described at column 7, line 7 of Thust, the elements 25 are microphones which are there for the purpose of detecting the sounds created when the paper of Thust is struck by a hammer.

While the Shakespeare reference does teach a method of analyzing the color of an object based upon multiple light sources of different wavelengths, it is noted that Shakespeare is directed to an absolute measurement of color such as for the purpose of quality control in the production of paper or the like. It is not directed to a separator system of any kind.

Turning now to the dependent claims, claims 32 and 33 specifically deal with the use of red, blue and green light sources, which in claim 33 are required to be emitted from red, green and blue light emitting diodes.

The Examiner acknowledges that even the Shakespeare reference does not disclose use of red, blue and green. Once again the Examiner resorts to unsupported speculation when he hypothesizes that “using a combination of red, blue, green for determining a color of paper would have been known”. If that is true, then the Examiner should be able to cite a reference which shows the use of red, green and blue source lights for sorting paper.

Claim 34 is directed to a very specific mathematical manipulation of the measured data to determine color, namely the computing of “log slopes based upon ratios of the logs of the reflectivity of the different colored lights”.

Claim 35 is directed to the specific method of “computing a visible intensity representative of the combined reflectivity of red, green and blue light”.

Once again the Examiner has cited absolutely no art to support his rejection of those claims but has indicated that “it would have been obvious a

design choice". That simply is unsupported. The Examiner has not cited any reference which shows, for example, the computation of log slopes based upon ratios of the logs of reflectivity of different colored lights as a technique known to the art for determination of color of paper in a paper sorting system.

Claim 38 is of particular significance, and the Examiner has not even begun to address the novel features found therein. Claim 38 is directed Applicant's very unique process as illustrated in Fig. 6 of the application wherein the different colors of light are first shined on the paper in a first sequence, and then in a second sequence which is the reverse of the first sequence. Two reflected light signals are generated for each wavelength of light, and then the analysis of the two reflected light signals can be combined "to correct for dynamic aberration of the sensed color of the paper moving within the inspection zone".

The Examiner has not even mentioned this feature. Surely the Examiner does not suggest that this technique involves "an obvious design choice". A design choice among what options? To Applicant's knowledge no one has ever proposed such a technique for correcting for dynamic aberration when sensing color of a moving object. Claims 39-42 further expound upon this technique and none of the additional features of these claims are in any way shown or suggested in the context of a system for correction of dynamic aberration of the sensed properties of moving objects. Accordingly, for these further reasons claims 38-42 should be allowed.

### **Independent Claim 43 and Dependent Claims 44-52**

Independent claim 43 is specifically addressed to the technique just discussed regarding claim 38 wherein the inspection zone is first sequentially interrogated with multiple light sources in a first series of sequential flashes, and then there is a second series of sequential flashes in the inverse order of the first series. Then the reflections are analyzed including consideration of two reflections originating from each light source, one of those originating during the first series and the other during the second series.

In his rejection of this claim, the Examiner simply referred to his rejection of claim 31, but it is respectfully submitted that the Examiner has completely overlooked very substantial differences between those claims. Claim 31 has nothing to do with sequential interrogation in a first series of flashes followed by a second series in inverse order of the first series, then followed by analysis based upon consideration of two reflections from each light source.

Accordingly, claim 43 and all those claims dependent therefrom should be allowed. Claims 44-52 address a number of very specific features of this system for correcting dynamic aberration, and the Examiner has not addressed any of them.

For example, claim 44 requires that the two reflections from each light source be averaged.

Claim 45 requires that there be included in the series of flashes “an interval of no light flashes from any of the multiple sources between the first and second series”. The Examiner has not even addressed this issue.

Claim 48 specifically requires that “the consideration of two reflections originating from each light source in step (c) corrects for dynamic aberration of the sensed color of the object moving within the inspection zone and thereby approximates a true color of the object”. The Examiner has not even addressed this feature, and certainly it is not shown or suggested by any of the cited references.

Claim 49 requires that in step (b) “the first and second series of sequential flashes are performed during an interrogation time interval less than a time required for a pixel of an object equal in size to the inspection zone to move through the inspection zone”. Again the Examiner has not even addressed this feature.

Accordingly, it is respectfully submitted that claim 43 and all claims dependent therefrom should be allowed.

### **Independent Claim 53 and Dependent Claims 54-61, 64 and 65**

The Examiner has rejected independent claim 53 under 35 U.S.C. §103 based upon Thust. The Examiner states his rejection with regard to claim 53 as follows at page 2 of the Office Action:

"With respect to claim 53, refer to discussion in claim 1 above. Further, Thust discloses using a plurality of light transmitters 25 (fig 2) and a plurality of sensor elements 47, 41 (fig 2). Thust does not explicitly disclose an array of light transmitter and an array of sensors. However, using an array of transmitter including red, green and blue lights and an array of sensor elements would have been known. It would have been obvious to substitute the plurality of light transmitters and sensors in Thust's system with the known transmitter and sensor array to make the system more compact. The modification involves only routine skill in the art."

That rejection is respectfully traversed for the following reasons.

As has been discussed above, the Examiner has provided absolutely no basis for his contention that "using an array of transmitters including red, green and blue lights and an array of sensor elements would have been known".

There is simply no basis for the Examiner's rejection.

Accordingly, claim 53 and all those claims dependent therefrom should be allowed.

Claim 54 includes the two sequential series of flashes, with the second series being the reverse of the first as has previously been discussed. As previously noted, there is absolutely no basis in any of the cited references for rejection of that claim.

With regard to claims 55-58 the Examiner has stated his rejection as follows:

“With respect to claims 55-58, it would have been obvious a design choice to modify Thust with a mirror to direct the light to different location or a transparent or reference wear cover to facilitate the sorting. The modification involves only routine skill in the art.”

Again, there is no prior art basis for the Examiner’s rejection.

There is no prior art support for the Examiner’s suggestion that it would have been an obvious design choice to “modify Thust with a mirror to direct the light to different location or a transparent or reference wear cover to facilitate the sorting”. These rejections are simply improper. The Examiner is not allowed to speculate as to what the art might show. The Examiner is required to cite references which teach each of the features in question and to show a prior art basis for combination of those references in order to support an obviousness rejection.

With regard to claims 64 and 65 the Examiner has stated his rejection as follows:

“With respect to claims 22-23, 64-65, since Thust discloses sensor 41, 47 (fig 2) for detecting the reflected signal (column 3, lines 30-35), it would have been obvious a design choice to modify the sensor with a threaded irregular internal surface for deflecting the light beam to improve the system performance. The modification involves only routine skill in the art.”

Once again the Examiner's rejection is not based upon any prior art teaching but is pure speculation. There is no prior art basis for the Examiner's suggestion that it would be obvious to modify the sensor "with a threaded irregular internal surface". The Examiner is using hindsight and the grossest speculation. In the absence of any prior art teaching of a threaded irregular internal surface for deflection of a light beam, the Examiner must allow these claims.

### Conclusion

In summary, it is believed that the arguments set forth above are sound, and accordingly reconsideration of the application is requested along with an early indication of the allowance of claims 1-3, 12-16, 22-26, 31-35, 38-61, 64 and 65 which the Examiner has previously considered in addition to claims 4, 5, 7, 17 and 18 which also read upon the elected species as noted above.

Furthermore, upon allowance of the generic claims, the restriction requirement should be removed and all claims 1-65 should be allowed.

Respectfully submitted,



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